

# Publishing results of medical research: the effect of pressure or a natural intention to advance scientific knowledge?

## *Publikowanie wyników badań medycznych: wpływ presji czy naturalny zamiar pogłębiania wiedzy naukowej*

Jarosław Karpacz , Konrad Januszewski , Aleksandra Pisarska 

Faculty of Law and Social Science, Jan Kochanowski University, Kielce, Poland

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**Key words:** publication pressure, medical research, bibliometric study, medical universities.

**Słowa kluczowe:** presja publikacyjna, badania medyczne, badanie bibliometryczne, uniwersytety medyczne.

### Abstract

**Introduction:** We expect that the issue discussed in this article will contribute to this academic debate and reveal the question of publishing scientific research results in one of the extremely important social areas of knowledge, namely medicine. In our opinion, it will provide arguments to answer the question concerning the ways in which institutional and environmental pressure influenced the publication activity of scientists in this scientific discipline at Polish medical universities.

**Aim of the research:** The aim of this article is to present the results of a survey of the intensity of publication activity among medical science researchers at Polish universities. This intention was accomplished using bibliometric analysis based on quantitative indices depicting the publication activity of medical university employees in Poland who located the results of their research efforts in the field of “medicine”, which were published between 2017 and 2023. Additionally, we wish to unveil the main topic clusters.

**Material and methods:** The bibliometric study included publications that were published between 2017 and 2023 by employees of public medical universities in Poland, and at the same time these entities are included in the World University Rankings 2024 in the field of clinical and health for the region of Poland, which is commonly used in such studies.

**Results and conclusions:** The results of our research in this area completed a subset of the broad scientific landscape associated with the ‘publishing game’. In medicine, as in other socially high-status disciplines, competition for prestige is the norm and publishing is a way to gain recognition in the community.

### Streszczenie

**Wprowadzenie:** Oczekujemy, że poruszana w artykule problematyka przyczyni się do akademickiej debaty i odsłoni kwestię publikowania wyników badań naukowych w jednym z niezwykle ważnych społecznych obszarów wiedzy, jakim jest medycyna. Naszym zdaniem dostarczy argumentów do odpowiedzi na pytanie, w jaki sposób presja instytucjonalna i środowiskowa wpływała na aktywność publikacyjną naukowców z tej dyscypliny naukowej na polskich uczelniach medycznych.

**Cel pracy:** Przedstawienie wyników badania intensywności działalności publikacyjnej wśród badaczy nauk medycznych na polskich uczelniach. Zamierzenie to zostało zrealizowane poprzez analizę bibliometryczną opartą na wskaźnikach ilościowych obrazujących aktywność publikacyjną pracowników uczelni medycznych w Polsce, którzy zlokalizowali wyniki swoich badań naukowych z zakresu „medycyny”, które ukazały się w latach 2017–2023. Dodatkowo pragniemy przedstawić główne grupy tematyczne.

**Materiał i metody:** Badaniem bibliometrycznym objęto prace naukowe opublikowane w latach 2017–2023 przez pracowników publicznych uczelni medycznych w Polsce, a jednocześnie podmioty te znalazły się w światowych rankingach uniwersytetów 2024 w obszarze klinicznym i zdrowotnym dla regionu Polski, który jest powszechnie stosowany w tego typu badaniach.

**Wyniki i wnioski:** Wyniki naszych badań w tym obszarze uzupełniły podzbiór szerokiego pejzażu naukowego kojarzonego z „grą wydawniczą”. W medycynie, podobnie jak w innych dyscyplinach o wysokim statusie społecznym, rywalizacja o prestiż jest normą, a publikowanie sposobem na zdobycie uznania w społeczeństwie.

### Introduction

Universities, financed mainly from public funds, including those with medical status, have for some time been encouraged to operate in accordance with

the principles of New Public Management due to existing solutions regulating the higher education system [1–3]. In practice, this means that their operating mode is becoming similar to the one that corporations

have, and they are therefore dominated by the concept of excellence [4], the main measure of which (in relation to universities) is the level of publishing activity of university employees [5–7]. It is therefore not surprising that this type of orientation of universities leads to widespread pressure from the managing authorities of these units/entities to intensify the publication of research results by their employees [8]. Owing to this, universities can present themselves as research-oriented institutions, and the scientific prestige built on this foundation affects funding. Universities encourage their researchers to publish their research results even more intensively in world-renowned journals. This mechanism makes employees feel that they are becoming “creative machines” [9]. It is sometimes noted that this type of orientation of public universities has contributed to reducing the number of differences between European and American universities [10], in which the employment of a scientist is closely related to their ability to produce high-quality publications.

Shaping university excellence requires appropriate tools and measures of results, such as journal rankings. Their use triggers much broader implications than those intended to discipline scientists and increase their scientific performance [4]. For instance, a broad academic debate points to the inevitable consequences of the “publishing game” caused by journal rankings and their sometimes-uncritical use, leading to the release of the idea called “you exist where you publish” [11]. This approach may primarily pose a threat to the diversity and innovation of research, to research traditions and niche research areas [12], as well as trigger excessive competition among scientists. This may threaten the quality of scientific research and, in consequence, also education.

We expect that the issue discussed in this article will contribute to this academic debate and reveal the question of publishing scientific research results in one of the extremely important social areas of knowledge, namely medicine. In our opinion, it will provide arguments to answer the question concerning the ways in which institutional and environmental pressure influenced the publication activity of scientists in this scientific discipline at Polish medical universities. We assumed that the publication pressure is the result of the corporatisation of medical universities in Poland, which has been strengthening over recent years, as shown by the results of recently conducted research in this area [13]. At the same time, publication pressure, in our definition, is constituted by a phenomenon increasing the intensity of publishing to a level higher than the one resulting from the natural pursuit of knowledge development through dissemination (publishing) of the results of research projects and motives resulting from the narcissism of scientists [14].

In this context, the aim of this study is to identify the intensity of publishing activity among medical researchers at Polish universities.

This intention will be achieved by using bibliometric analysis based on quantitative indicators illustrating the publication activity of employees of medical universities in Poland, who located the results of their research efforts in the area of “medicine”, and those efforts were published in the years 2017–2023. Additionally, we would like to reveal the main topic clusters in which these publications appeared, the inclusion of which in an article is generally believed to increase researchers’ chances of having it published in a prestigious journal. We expect that the results of our research in this area will complement observations and reveal a part of the broad scientific landscape related to the “publishing game”. It may influence the choice of a research topic, given that researchers are aware that the probability of being published in certain journals depends not only on the quality of their research, but also on the topic discussed. Additionally, they may perceive some of the top journals as not being as general as their mission defines them, because evidence might suggest that they do not publish the most cited articles in certain topical and methodological areas. Therefore, this phenomenon, especially in medical sciences, is considered undesirable [15]. A publication should not be considered as guiding the first stage of the research process. In addition, we will complement these observations, using appropriate indicators, recognising the significance of published scientific works, and therefore their impact on the research community, and thus their potential importance for the development of knowledge.

### Theoretical background

The global landscape of contemporary higher education is shaped by the neoliberal policy of performativity and marketisation [16]. Although with varying intensity and speed, neoliberal behaviours and norms have been incorporated into organisational practices and expressed in the policies of public universities around the world [17], including in Poland [13]. The neoliberal path of these entities has resulted in new control mechanisms that have consequences for the conditions of conducting research, achieving scientific prestige and developing a reputation [18]. In these circumstances, publishing research results in prestigious journals is an important instrument with various individual and institutional consequences [19]. It is not controversial that publishing is essential for a scientist’s professional growth and important for developing their careers [20]. It is argued that dissemination of research results is the final stage of any research project, and it can be stated that only through the publication of research results can any individual project contribute to the overall knowledge in a giv-

en discipline. The accumulation of knowledge that comes from a continuum of scientific research conducted over centuries that we know about today is crucial to the development of a given profession. Research constitutes creative and systematic work conducted with the aim of increasing knowledge about people, the environment, culture, and society and using this knowledge to develop new applications [21]. Research is used to establish or confirm facts, confirm the results of previous work, solve problems, support theories, or develop new ones.

The scientific (publication) achievements resulting from research defined in this manner are a standard criterion of the effectiveness of individual researchers and research institutions [21]. The growing prestige and emphasis on the number of publications increases competition between researchers. This competition has traditionally been considered as an incentive to produce high-quality studies, but in practice there are also undesirable consequences of this hyper-competitive publishing climate in which a scientist is judged primarily on the number of publications. This may result in putting pressure on researchers to publish [22]. Publication pressure is being studied for its impact on research integrity since it can persuade researchers to cut corners [23]. Publication pressure is also associated with burnout among senior scientists, as well as with young researchers leaving their academic careers [24].

The problem is even more serious when we take into consideration the fact that the previously mentioned original purpose of a publication, which is the development and dissemination of knowledge, may be lost, which suggests the danger of shifting this purpose with possible harmful consequences for the strategies of individual researchers and research teams [10]. The abundant literature reveals critical issues and ambiguities related to the measurement of universities' performance [25], showing that linking financial incentives and career development with publication indicators has a significant impact on re-orienting individual behaviours of scientists [9, 26].

This issue is also present in the field of medical science, which has a vast scope and is essential for treating diseases and improving the health of individuals and the entire population, with the ultimate goal of extending knowledge beyond what is already known. A person's (researcher's) knowledge will only contribute to developing science when it is presented to others for an independent assessment of its validity. For this purpose, it is necessary to publish articles mainly in prestigious scientific journals, which increases the chances of contributing to the expansion of knowledge of the medical community, as well as the researcher's recognition and well-deserved professional benefits (including awards), which will potentially encourage them to further research. In this form, this mechanism shows practically no controversies. However, if we take into account the pressure exerted by university management au-

thorities, in accordance with the concept of university management [9], on medical scientists employed in those entities with the aim of increasing the number of prestigious publications, this mechanism may transform its current status based on scientific knowledge and environmental prestige, releasing pressure that may have a negative impact on the quality of research. This, in turn, may cause an interaction between high working demands and low resources among medical scientists [27], i.e. stress, development of predatory journals and manuscript writing services, a decrease in the quality of scientific publications, and a mad race for publications.

Moreover, it may lead to the belief that there is only one option – publish or perish. Under current rules, research publications in indexed journals are mandatory for promotion at many public medical universities. Additionally, quantitative measures of scientific achievements are the basis for financial rewards and grants awarded to scientists, and career development opportunities, prestige, and status depend on their implementation [28], but not only them – the intensity of competition between scientists as well. However, competition for publications and research funding is itself a driving force for scientists, increasing the effectiveness of their activities. For this reason, indicators of scientific achievement are, as already indicated, used as a parameter for assessing the effectiveness of both individual scientists conducting medical research and medical universities [28], which sometimes combine the number of publications with the selection and promotion of employment and education in medical fields of study. This increases the pressure on researchers also in the field of medical sciences to publish in prestigious journals. This increased pressure on scientific achievements has been accompanied by an enormous increase in the number of publications and publishers in recent decades. In these circumstances, there are concerns that scientists want to obtain “publish-ready” results, which may be at the expense of quality, validity, scientific rigor, and personal integrity. The matter is even more serious when we note that the potential negative effects of the publication pressure are less frequently highlighted in the literature [29], while it has been shown that unreliable medical research results are not uncommon. For instance, a recent study [30] found that 4.2% of authors who published in major journals dedicated to medical imaging had committed research fraud in the last 5 years, and 25.4% had witnessed or suspected a research fraud committed by faculty colleagues in the past 5 years. Fraud in medical imaging research was more common among younger scientists. Another recent study found that the number of withdrawn publications in medical sciences is still increasing, with scientific unreliability being the primary cause of this phenomenon. These data are disturbing. On the one hand, they

may undermine confidence in the findings contained in medical publications. On the other hand, unreliable research may harm patient care and, as a consequence, may threaten the patient's health and, in severe cases, even life. The pressure on researchers to publish more and in high-impact journals is the main reason that can provoke scientific unreliability. This, in turn, in the case of medical research, may result in a real threat to clinical practice based on research results [28]. Additionally, stress and burnout symptoms caused by the pressure to increase the number of scientific publications may also impact the poor mental well-being of physicians and residents, and consequently patient care, education and research.

Recent research has critically assessed the cultural, institutional, and organisational factors that may persuade academics to focus on research publications in specific journals, possibly at the expense of originality and intellectual innovation rather than research results per se (e.g. [31, 32]). The pressure to publish in the leading science journals encourages scientists to prioritise established publication trends, in particular by "gap hunting" to accelerate incremental knowledge production at the expense of bypassing interesting and influential research areas [33]. Some researchers warn that such practices lead to intellectual stagnation, conformism, and conservatism [34].

On the other hand, there is concern that the expectation of publishing in journals that are at the top of the ranking lists may reduce research to a game of academic politics, marginalising researchers who do not possess the required political skills [34]. This is a problem particularly for young researchers and for those at non-elite universities, as shown by research conducted among academics. Some authors therefore criticise the use of assessments based on quantitative measures as a powerful weapon of managerial control that spreads divisions and changes the rules of academic life [35].

In medicine, as in other disciplines with a high social status, competition for prestige is a standard practice, and publications are a way to gain recognition in the community. Being the strongest and most reliable predictor of success [36], research results are more and more often used as a measure of academic productivity with clear links to academic advancement and prestige around the world [37]. Therefore, to prove their worth, scientists must demonstrate consistent productivity in terms of English publications in indexed journals [38]. The message for scientists working in this environment is crystal clear: to succeed in the academic community, you must publish regularly [39] and do it in English language.

The pressure of performativity in the form of publications in selected journals promotes a sense of uncertainty, which often makes researchers susceptible to dominant practices and results in the acceptance of conformist attitudes [40].

Meanwhile, it is a balanced research climate combining competition with the persistence of striving to learn about the world that is a prerequisite for the development of scientists and universities and for the compliance with ethical standards in scientific research. Valuable academic work should therefore not be limited to writing articles to be published [32].

In these circumstances, after noticing, on the one hand, the necessity to publish the results of scientific research and the natural willingness to popularise them for the development of scientific knowledge, and, on the other hand, after identifying the institutional and environmental pressure to increase quantitative measures based on publications, it was decided to measure the phenomenon of publication pressure in order to determine its intensity.

### **Aim of the research**

The aim of this article is to present the results of a survey of the intensity of publication activity among medical science researchers at Polish universities. This intention was accomplished using bibliometric analysis based on quantitative indices depicting the publication activity of medical university employees in Poland who located the results of their research efforts in the field of "medicine", which were published between 2017 and 2023. Additionally, we wish to unveil the main topic clusters.

### **Material and methods**

The bibliometric study covered publications published in the years 2017–2023 by employees of public medical universities in Poland. At the same time, these entities are included in the World University Rankings 2024 in the field called "clinical and health" for the region of Poland, which is a commonly used ranking in this type of research. The choice of this period was dictated by the radical changes that took place in the higher education system in Poland at that time, including those relating to the evaluation of the quality of universities' scientific activities. It was assumed that incorporating an evaluation mechanism into this system, depending largely on the journals' scoring, would reveal the expected behaviours of scientists. On the one hand, 2017 was the time immediately before the announcement of new solutions. However, 2023 was a year after the end of the 4-year period (which was extended to 5 years due to the SARS-CoV-2 virus, which caused the COVID-19 pandemic [41]) of evaluation of the university's scientific activities. We expect that this interval is long enough to reveal the possible occurrence of publication pressure or absence of it. The results of the bibliometric study were preceded by a systematic review of the literature made for the issue of publication pressure as adequate and recognised to establish the existing state of knowledge [42].

The research procedure we used was developed in a manner adequate to the specific research problem and, at the same time, in a manner similar to other research conducted in this area. It proceeded in the following stages:

1. Selection of the database – the SCOPUS database was selected as the largest scientific database. SciVal 10 was used as a dedicated comparison tool for the SCOPUS database.

2. Selection of research objects – the World University Rankings 2024 was used. The ranking is published by Times Higher Education. It is also built on the basis of the SCOPUS database. All Polish universities in the field named “clinical & health” were selected for the study.

3. Such identified universities were selected in the SciVal 10 tool for analysis. The field of Medicine was selected (according to the AJSC). All types of publications included in the SCOPUS database (articles, reviews, conference papers, books and book chapters) were selected as sources for the analysis. The research period was from 2017 to 2023.

4. SO, FWCI, and FWVI indicators were generated in accordance with the assumptions adopted above.

5. Using the SciVal 10 tool, a Topic Cluster was generated for the field of Medicine (according to the ASJC) for the period 2020–2023 for 2 geographical areas (Poland and the World).

Table 1 includes a set of Polish medical universities whose scientific achievements are published in journals available in the SCOPUS database according to the All Science Journal Classification Codes (ASJC).

## Results

### The Scholarly Output (SO) indicator for the field of Medicine – SOM, All Science Journal Classification Codes (ASJC)

The Scholarly Output (SO) indicator for the field of Medicine – SOM, All Science Journal Classification Codes (ASJC) – includes all classification codes of scientific journals. The SOM indicator informs about the number of published scientific achievements/studies of employees of individual medical universities (in the field of medicine).

Table 2 and Figure 1 contain data on the number of scientific studies published in the Scopus database for the field of Medicine in the years 2017–2023. Findings have been made regarding the Scholarly Output indicator in Medicine (SOM). The SOM indicator presents the number of publications indexed in the Scopus database. The largest numbers of items representing scientific achievements in the Scopus database in the field of medicine were published by employees of the Medical University of Warsaw (MUW) and the Jagiellonian University in Krakow (JUK). At MUW, there were 9832 items in the years 2017–2023, the largest number of publications written by the em-

**Table 1.** Surveyed medical universities

Abbreviations used	Medical university name
JUK	Jagiellonian University in Krakow
JKUK	Jan Kochanowski University of Kielce
MUB	Medical University of Bialystok
MUG	Medical University of Gdansk
MUL	Medical University of Lublin
MUSK	Medical University of Silesia in Katowice
MUW	Medical University of Warsaw
MULD	Medical University of Lodz
NCUT	Nicolaus Copernicus University in Torun
UMSP	University of Medical Sciences Poznan
UWMO	University of Warmia and Mazury in Olsztyn
WMU	Wroclaw Medical University

Source: own study.

ployees of this university was published in 2021 (1742 items), whereas at JUK there were 9425 achievements published according to the analysed classification and SOM indicator. The lowest numbers of publications according to the SOM indicator in the years 2017–2023 were determined for the Jan Kochanowski University of Kielce (JKUK) and the University of Warmia and Mazury in Olsztyn (UWMO). At JKUK there were 1229 studies, and at UWMO there were 1903 published achievements. During this period, at JKUK the lowest number of studies was recorded in 2017 (108 publications), and the highest in 2022 (233 publications), while at UWMO the lowest number of publications identified in 2017 was 186 achievements, and in 2022 there were 375 published achievements.

Table 2 and Figure 1 indicate growing publication activity in all analysed Polish medical universities classified in journals available in the SCOPUS database according to the ASJC until 2021, and these were as follows: JUK (in Krakow), MUB (in Bialystok), MUG (in Gdansk), MUL (in Lublin), MUW (in Warsaw), UMSP (in Poznan), and WMU (in Wroclaw). At some universities the growing activity occurred until 2022, and this group included the following: JKUK (in Kielce), MUSK (in Katowice), MULD (in Lodz), NCUT (in Torun), and UWMO (in Olsztyn). In the year 2023 all surveyed universities recorded a decline in the number of publications published according to the ASJC and analysed with the established SOM indicator.

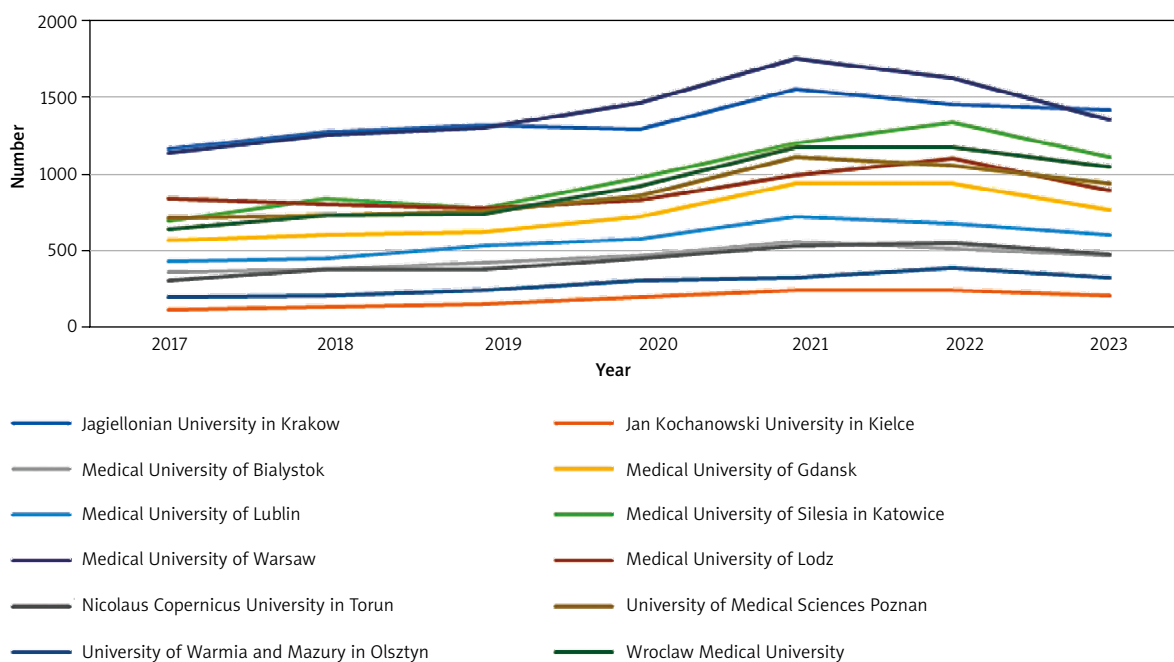
### The Field-Weighted Citation Impact indicator for the field of Medicine – FWCIM

The Field-Weighted Citation Impact indicator for the field of Medicine – FWCIM is an indicator present-

**Table 2.** Scholarly Output indicator for the field: Medicine – SOM (in accordance with ASJC)

Medical universities	Years							Total
	2017	2018	2019	2020	2021	2022	2023	
Jagiellonian University in Krakow	1157	1265	1312	1281	1549	1447	1414	9425
Jan Kochanowski University in Kielce	108	125	145	190	229	233	199	1229
Medical University of Bialystok	350	364	416	458	546	503	463	3100
Medical University of Gdansk	559	593	611	712	931	930	761	5097
Medical University of Lublin	418	443	520	569	710	665	594	3919
Medical University of Silesia in Katowice	686	830	766	963	1196	1326	1102	6869
Medical University of Warsaw	1127	1247	1296	1453	1742	1617	1350	9832
Medical University of Lodz	826	791	768	825	984	1089	889	6172
Nicolaus Copernicus University in Torun	299	370	370	443	526	537	467	3012
University of Medical Sciences Poznan	705	722	746	848	1106	1049	934	6110
University of Warmia and Mazury in Olsztyn	186	195	228	293	316	375	310	1903
Wroclaw Medical University	632	722	728	909	1168	1162	1035	6356
Total	7053	7667	7906	8944	11003	10933	9518	63024

Source: own study.

**Figure 1.** Scholarly Output indicator for the field: Medicine – SOM (in accordance with ASJC). Source: own study.

ing the significance of citations in a given scientific field in relation to the average of all similar publications.

The indicator for the  $N$  value defined as a given university is calculated according to the formula

$$FWCI = \frac{1}{N} \sum_{i=1}^N \frac{c_i}{e_i} \quad (c_i - \text{number of citations of a publication}$$

in a given year and 3 previous years,  $e_i$  – expected number of citations of a publication in a given year and 3 previous years).

A FWCI value of 1 indicates that a set of given publications in a scientific field is at an average global level. Values exceeding 1 indicate greater significance (e.g. an indicator of 1.25 means that the publications of a given entity were cited 25% more often than the world average, while an indicator of 0.90 signifies that the publications of a given entity were cited 10% less often than the world average). The indicator was developed by ELSEVIER and is part of the SciVal tool.

**Table 3.** Field-Weighted Citation Impact indicator for the field: Medicine – FWCIM (in accordance with ASJC)

Medical universities	Years							
	2017	2018	2019	2020	2021	2022	2023	2017–2023
Jagiellonian University in Krakow	3.01	2.67	1.64	1.77	1.47	1.56	1.56	1.91
Jan Kochanowski University in Kielce	0.62	0.63	0.73	0.76	1.05	0.94	1.09	0.87
Medical University of Bialystok	1.59	1.29	0.9	1.01	1.63	1.32	1.15	1.28
Medical University of Gdansk	2.19	1.7	1.29	1.27	1.49	1.38	1.82	1.57
Medical University of Lublin	1.45	0.88	0.82	0.97	1.25	0.98	0.96	1.04
Medical University of Silesia in Katowice	1.55	1.04	0.99	0.86	1.09	1.41	1.62	1.23
Medical University of Warsaw	1.47	1.11	1.2	1.24	1.31	1.3	1.48	1.3
Medical University of Lodz	1.76	2.7	2.02	2.74	1.91	2.16	1.54	2.11
Nicolaus Copernicus University in Torun	1	0.95	0.81	0.98	0.99	1.08	1.27	1.02
University of Medical Sciences Poznan	0.92	1.14	1.01	0.96	1.16	1.24	1.39	1.13
University of Warmia and Mazury in Olsztyn	0.88	0.81	0.99	1.61	2.33	1.61	2.3	1.61
Wroclaw Medical University	3.78	1.53	1.87	1.76	2.42	1.55	2.25	2.11

Source: own study.

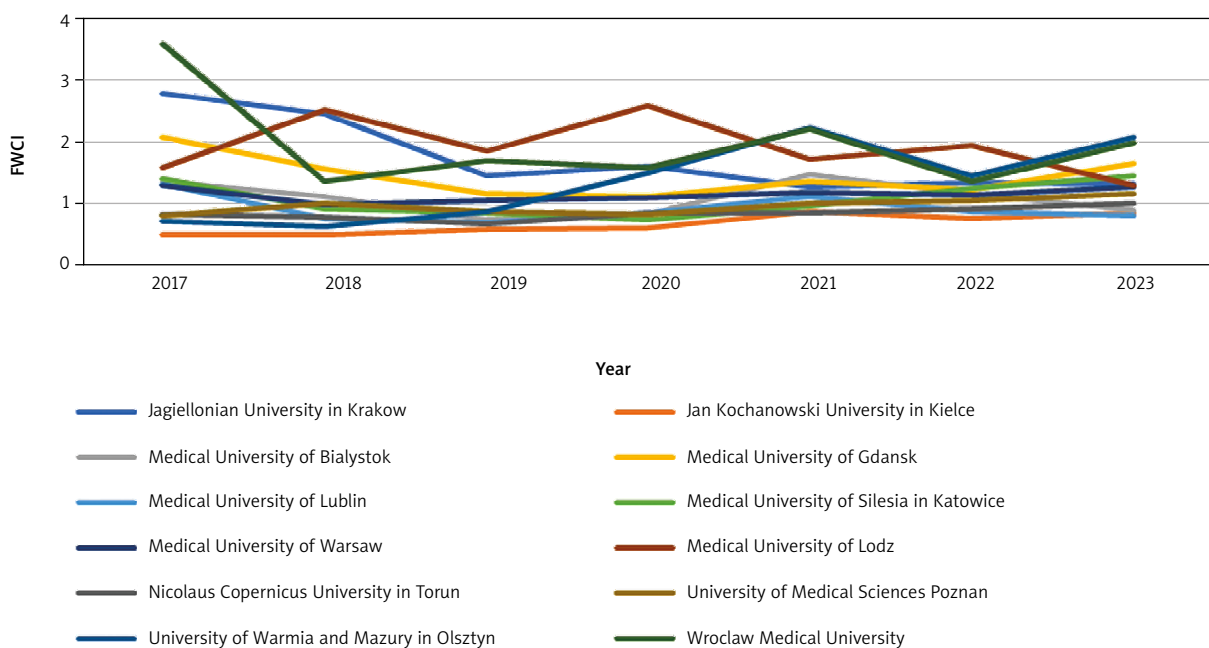
**Figure 2.** Field-Weighted Citation Impact indicator for the field: Medicine – FWCIM (in accordance with ASJC). Source: own study.

Table 3 and Figure 2 present the FWCIM citation indicators in the field of medicine (FWCIM) established for all Polish public medical universities, in the established values based on data from the Scopus database for the field of Medicine in the years 2017–2023.

The highest levels of the studied FWCIM indicator were found at WMU (in Wroclaw) in 2017 – during this period it was set at 3.78; at JUK (in Krakow) also in 2017, its level this year equalled 3.01; in 2020

at MULD (in Lodz), in this university the indicator was set at 2.74; in 2017 at MUG (in Gdansk), in which it was 2.19; and in the following 2018 at MULD (in Lodz), this year it was set at 2.70. At MULD (in Lodz) in 4 out of the 7 examined periods of time, the FWCIM indicator was set at a level above level 2, while at WMU (in Lodz) the indicator obtained in 2017 at the level of 3.78 resulted in the fact that the average established for this unit for the period 2017–2023 also exceeded level 2.

The lowest levels of the studied FWCIM indicator were identified at JKUK (in Kielce) in 2017 and 2018 at the levels of 0.62 and 0.63, respectively. This university scored levels of the indicator below one in 4 out of the 7 examined periods.

Table 3 and Figure 2 present FWCIM indicators in all Polish public medical universities, and their values vary widely. Only 2 of the surveyed universities achieved (only in one surveyed year – 2017) levels of the studied indicator above 3, and these were the JUK (in Krakow) and WMU (in Wroclaw).

The lowest levels of the analysed indicator were set at JKUK (in Kielce), where the average indicator in the examined period was set at 0.87; at NCUT (in Torun), where the indicator reached the level of 1.02; and at MUL (in Lublin) where it equalled 1.04.

### The Field-Weighted Views Impact (FWVI) for the field of Medicine (FWVIM)

The Field-Weighted Views Impact (FWVI) for the field of Medicine (FWVIM) is an indicator presenting the number of views for publications of a given university in relation to the average number of views obtained by all other similar publications in the SCOPUS database: the FWVI shows the way in which the number of views of publications of a given university can be compared to the world average. Similar publications in the SCOPUS database are those publications that have the same year of publication, publication type, and discipline (according to the ASJC). A value of FWVI equalling 1 indicates that a set of given publications in the researched scientific field is shaped at an average global level. Values exceeding 1 indicate greater importance (e.g. an indicator

of 1.25 means that the publications of a given entity were viewed 25% more often than the global average, while an indicator of 0.90 indicates that the publications of a given entity were viewed 10% less often than the world average. The indicator was developed by ELSEVIER and is part of the SciVal tool.

Table 4 and Figure 3 present the levels of the FWVIM indicator. The highest of them at the surveyed public medical universities was found in WMU (in Wroclaw) in 2017 at the level of 3.43, then at MUL (in Lodz) where indicators exceeding level 3 were recorded in 2 surveyed periods of time – in 2020 it was set at level 3.31 and in 2018 at the level of 2.83. At JUK (in Krakow) in 2017, the indicator was found to be 2.74. In all remaining years that were examined, no FWVIM indicator was detected at a level above 2 in the analysed universities.

The lowest levels of the FWVIM indicator were found at NCUP (in Torun) in 3 examined years (2019–2021), these were the levels: 0.96, 0.91, and 0.95, respectively. Two such periods with levels of this indicator below 1 were recorded at JKUK (in Kielce) in 2020 when it equalled 0.84 and in 2019 when it was set at 0.97. Likewise, in 2 periods examined, the FWVIM indicator at levels below 1 was found at UMSP (in Poznan) in 2020 at 0.91 and at 0.96 in 2023. During the studied period, one entity was found among the surveyed universities with the level of the analysed indicator below 1, and this was MUSK (in Katowice) in 2020, when the indicator was set at 0.9.

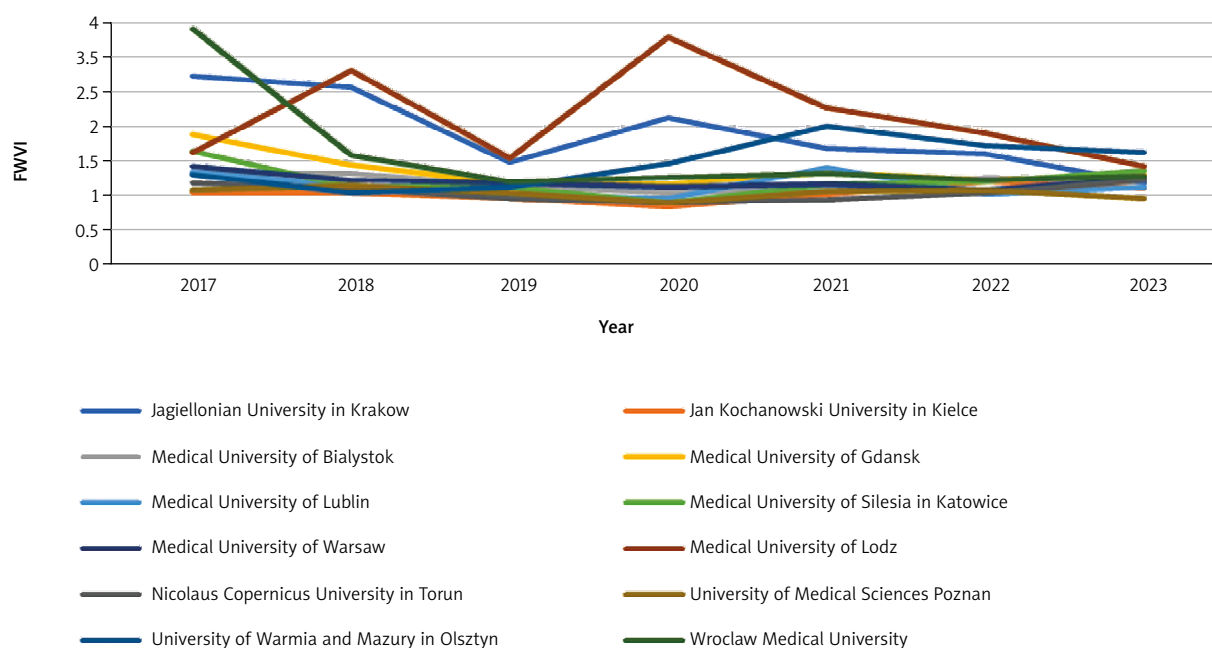
Table 4 and Figure 3 indicate a varied situation regarding the levels of the studied indicator in public medical universities listed in the SCOPUS database. The FWVIM indicator shows interest in the publications of Polish scientists conducting research in the field of medicine and publishing their achieve-

**Table 4.** Field-Weighted Views Impact indicator for the field: Medicine – FWVIM (in accordance with ASJC)

Medical universities	Years							
	2017	2018	2019	2020	2021	2022	2023	2017–2023
Jagiellonian University in Krakow	2.74	2.58	1.5	2.14	1.7	1.61	1.2	1.89
Jan Kochanowski University in Kielce	1.04	1.04	0.97	0.84	1.02	1.22	1.11	1.04
Medical University of Bialystok	1.33	1.33	1.16	1.05	1.08	1.28	1.24	1.2
Medical University of Gdansk	1.89	1.45	1.2	1.18	1.35	1.24	1.31	1.35
Medical University of Lublin	1.36	1.16	1.01	0.96	1.41	1.02	1.13	1.15
Medical University of Silesia in Katowice	1.65	1.12	1.12	0.9	1.17	1.21	1.37	1.21
Medical University of Warsaw	1.43	1.23	1.19	1.12	1.17	1.09	1.25	1.2
Medical University of Lodz	1.63	2.83	1.55	3.31	2.29	1.91	1.43	2.12
Nicolaus Copernicus University in Torun	1.19	1.1	0.96	0.91	0.95	1.05	1.23	1.05
University of Medical Sciences Poznan	1.09	1.14	1.05	0.91	1.06	1.08	0.96	1.04
University of Warmia and Mazury in Olsztyn	1.31	1.04	1.12	1.48	2.01	1.74	1.63	1.54
Wroclaw Medical University	3.43	1.59	1.21	1.27	1.33	1.24	1.29	1.52

Source: own study.





**Figure 3.** Field-Weighted Views Impact indicator for the field: Medicine - FWVIM (in accordance with ASJC). Source: own study

ments, as well as affiliating them in the surveyed universities (public medical universities listed in the SCOPUS database). These indicators set as average for the examined period of 2017–2023 ranged from 1.04 to 2.12. The highest level (2.12) of the FWVIM indicator determined in this way was found at MULD (in Lodz), and the lowest (1.04) at JKUK (in Kielce) and at UMSP (in Poznan), also at the level of 1.04. At NCUT (in Torun), the average indicator for the studied period of 2017–2023 was also set at a low level of 1.05. It was at this university in Torun where there were 3 periods within the timeframe of 2017–2023 in which these indicators were below level 1.

#### The International Collaboration (IC) indicator for the field of Medicine – ICM

The International Collaboration (IC) indicator for the field of Medicine – ICM is an indicator presenting the participation of foreign co-authors in publications of a given unit (university) and is expressed as a percentage. Thus, it shows the percentage of publications of a given (researched) entity that has international co-authorship. The ICM indicator proves the activity of the research and teaching staff of Polish medical universities at the international level, by their cooperation with other medical academic centres. The exchange of knowledge and research results creates new solutions and progress in this field of science on an international scale.

Table 5 and Figure 4 show the participation of foreigners in the publications of a given university.

The highest levels of the analysed indicator were found at UWMO (in Olsztyn) where it equalled 48.7% in 2021 and 42.3% in both 2020 and 2023, as well as at WMU (in Wroclaw) in 2023 when it scored 44.5%, and at JUK (in Krakow) in 2023 – with 41.7%. In the remaining surveyed units, the level of the examined indicator was not exceeded in any of the studied years.

The lowest levels of the examined indicator were found for publications written at JKUK (in Kielce) in 2020 – 15.8%, and 20.1% in 2021.

Table 5 and Figure 4 indicate the participation of foreigners in the publications of Polish researchers at universities in Poland. The average lowest levels of this indicator ranged from 15.8% at JKUK (in Kielce) in 2020 up to 48.7% at UWMO (in Olsztyn) in 2021. The average values of the examined indicator in the years 2017–2023 were set at levels equalling 23.1% in JKUK (in Kielce), 25.7% at MUL (in Lublin), 27.8% at MUSK (in Katowice), 28.9% at MUB (in Bialystok), and 29.1% at UMSP (in Poznan); in these units they were the lowest in the examined period. The highest average levels (for 2017–2023) of the analysed indicator were found at UWMO (in Olsztyn) with the score of 37.2%, at MUG (in Gdansk) with 37.1%, at JUK (in Krakow) with 37.0%, and at WMU (in Wroclaw), at the level of 36.8%.

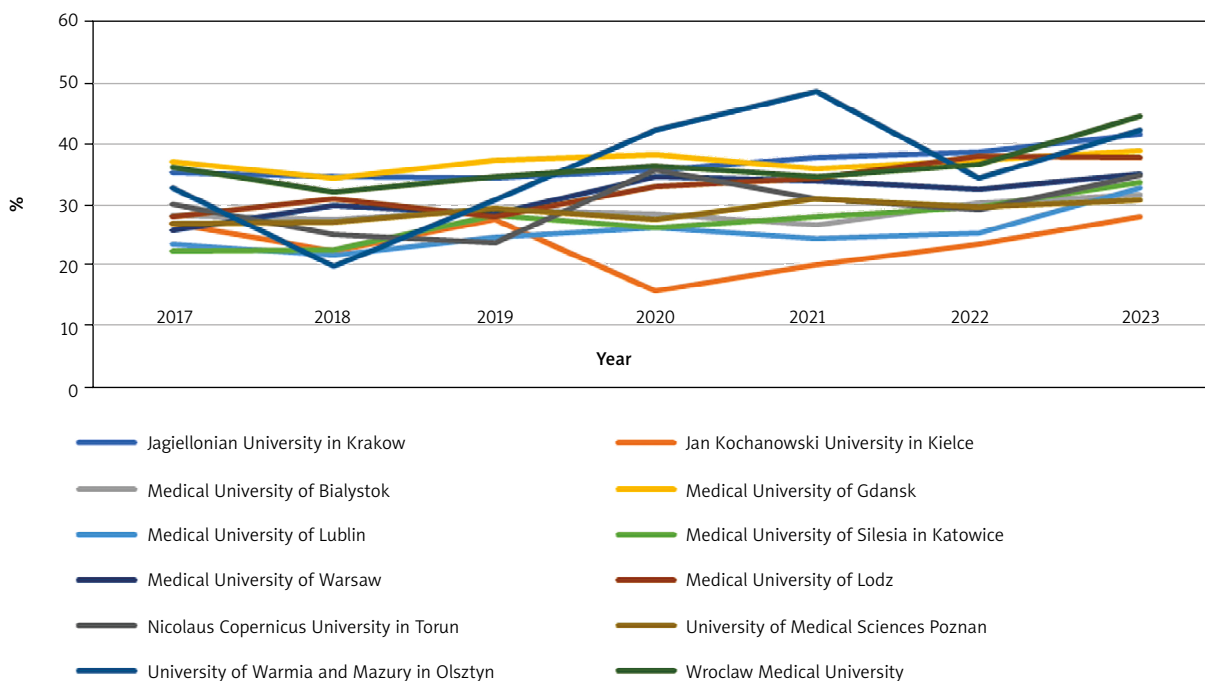
#### Topic Cluster -TC with the highest visibility for the field of Medicine – TCM

Topic Cluster -TC with the highest visibility for the field of Medicine – TCM is an indicator showing

**Table 5.** International Collaboration indicator for the field: Medicine – ICM (in accordance with ASJC in %)

Medical universities	Years (in %)							
	2017	2018	2019	2020	2021	2022	2023	2017–2023
Jagiellonian University in Krakow	35.4	34.5	34.4	35.8	37.8	38.7	41.7	37.0
Jan Kochanowski University in Kielce	26.9	22.4	27.6	15.8	20.1	23.6	28.1	23.1
Medical University of Bialystok	28.3	27.5	29.1	28.4	26.7	30.2	31.7	28.9
Medical University of Gdansk	37.2	34.4	37.3	38.3	35.9	37.3	38.9	37.1
Medical University of Lublin	23.4	21.7	24.6	26.2	24.4	25.3	32.7	25.7
Medical University of Silesia in Katowice	22.3	22.5	28.2	26.3	28.0	29.6	33.8	27.8
Medical University of Warsaw	25.8	29.8	28.5	34.5	33.9	32.5	35.1	31.8
Medical University of Lodz	28.1	31.0	28.1	33.0	34.3	37.9	37.7	33.2
Nicolaus Copernicus University in Torun	30.1	25.1	23.8	35.7	31.0	29.1	34.9	30.3
University of Medical Sciences Poznan	27.0	27.1	29.4	27.6	30.9	29.7	30.7	29.1
University of Warmia and Mazury in Olsztyn	32.8	20.0	30.7	42.3	48.7	34.4	42.3	37.2
Wroclaw Medical University	36.1	32.1	34.6	36.5	34.7	36.7	44.5	36.8

Source: own study.

**Figure 4.** International Collaboration indicator for the field: Medicine – ICM (in accordance with ASJC in %). Source: own study.

the topics with the highest number of views. The TC indicator combines 3 metrics: CiteScore, Citation Count and View Count. CiteScore shows the number of citations from the period of 4 years preceding the metric's calculation divided by the number of documents. The basis for calculating the Topic Cluster indicator is the number of citations and views of articles published in the last 2 years.

Table 6 presents the Topic Clusters that fall within 1% of the most visible/most frequently undertaken and published topics published by researchers from Polish scientific and research units. The table includes the names of those Clusters, their number in the SCOPUS database, the SO indicator, the FWCI indicator, and the Prominence Percentile (PP) indicator. The PP indicator shows the dynamics of a given Topic Clus-

**Table 6.** List of Topic Clusters for the field: Medicine – ICM for Poland (in ASJC methodology)

Topic cluster	Topic Cluster Number	SO indicator	FWCI indicator	PP indicator
COVID-19; SARS-CoV-2; Coronavirus	TC.1500	3519	2.19	100
T-Lymphocytes; Neoplasms; Immunotherapy	TC.12	1028	2.83	99.532
Metagenome; Probiotics; Bacteria	TC.215	967	1.42	99.064
MicroRNAs; Long Untranslated RNA; Neoplasms	TC.219	843	0.99	99.331

Source: own study.

**Table 7.** List of Topic Clusters for the field: Medicine – ICM for the World (in ASJC methodology)

Topic cluster	Topic Cluster Number	SO indicator	FWCI indicator	PP indicator
COVID-19; Severe Acute Respiratory Syndrome Coronavirus 2; Public Health	TC.1	245359	2.49	100
Gut Microbiota; Metagenomics; DNA	TC.80	45127	1.56	99.477
COVID-19; Mental Health; Severe Acute Respiratory Syndrome Coronavirus 2	TC.620	42046	2.59	99.738

Source: own study.

ter. A value of 100 indicates the most dynamic Topic Cluster for the studied field and area. The PP indicator combines the following metrics: the number of citations in a given year for publications from this year and the previous one, the number of views in a given year for publications from this year, and the previous one and the average CiteScore result (the number of citations of a publication in a given journal within the last 4 years divided by the number of publications indexed in SCOPUS for the same period) for 2020–2023.

The Topic Cluster: COVID-19; SARS-CoV-2; Coronavirus, whose number in the SciVal 10 database is TC.1500, had the largest number of publications with 3519 items in the analysed TC. The FWCI indicator (in TC.1500) reached the level of 2.19, and the PP indicator scored the dynamics level of 100.

In the Topic Cluster: T-Lymphocytes; Neoplasms; Immunotherapy, whose number in the SciVal 10 database is TC.12, 1028 publications were found, in which the FWCI indicator reached the level of 2.83, and the PP indicator scored the dynamics level of 99.532.

In the Topic Cluster: Metagenome; Probiotics; Bacteria, whose number in the SciVal 10 database is TC.215, 967 publications were identified, in which the FWCI indicator reached the level of 1.42 and the PP indicator scored the dynamics level of 99.064. However, in the Topic Cluster: MicroRNAs; Long Untranslated RNA; Neoplasms, whose number in the SciVal 10 database is TC.219, 843 publications were identified, in which the FWCI indicator reached the level of 0.99 and the PP indicator scored the dynamics level of 99.331.

Table 7 presents the Topic Clusters falling within 1% of the most visible (with the highest number of views)

topics in the world. The table contains the names of those Topic Clusters, their number in the SCOPUS database, the SO, the FWCI, and the PP indicators.

The Topic Cluster: COVID-19; Severe Acute Respiratory; Coronavirus Syndrome 2; Public Health, whose number in the SciVal 10 database is TC.1, had the largest number of publications with 245,359 items in the analysed Topic Cluster in the surveyed period. The FWCI indicator (in TC.1) reached the level of 2.49, and the PP indicator scored the dynamics level of 100. In the TC.80 Topic Cluster, 45,127 publications were found, in which the FWCI indicator reached the level of 1.56, the PP indicator – the dynamics level of 99,477. However, in the TC.620 Topic Cluster, the SO indicator was set at a level similar to TC.80 and amounted to 42,046; the FWCI indicator (presenting the significance of citations in a given field in relation to the average of all similar publications) was at the level (in TC.620) of 2.59 and the PP indicator was at a level higher than TC. 80, but lower than TC.1, scoring 99,738.

## Conclusions

The study, made in a deliberately determined time sequence, revealed the intensity of the publication activity of scientists at Polish medical universities, with particular emphasis on medical sciences. In this way, arguments were provided enabling the implementation of the intention adopted at the beginning. For this purpose, an appropriately selected set of bibliometric indicators with high information value was used.

The SOM indicator levels in all public medical universities were revealed. The study showed that the level of the SOM indicator, in the initial period

of analysis (in 2017 and 2018), remained at a constant or slightly increasing level (Table 2 and Figure 1). This growing publication activity was recorded in all analysed Polish medical universities classified in journals available in the SCOPUS database according to the ASJC until 2021. In turn, 2023 was the period in which all universities analysed according to the ASJC and surveyed with the established SOM indicator suffered a decline in the number of published achievements. However, the presented data showed a significant increase in the publication activity of employees in 2021. This was the last year of the evaluation introduced by the new Law on Higher Education and Science (2017–2021).

In turn, the FWCIM indicator (Table 3 and Figure 2) showed large differences in the publication activity of employees at all Polish public medical universities. Additionally, the FWVIM indicator (Table 4 and Figure 3) showed a diversified situation regarding its levels in public medical universities listed in the SCOPUS database. The indicator shows interest in the publications of Polish scientists conducting research in the field of medicine and publishing their achievements, as well as affiliating them in the surveyed universities (public medical universities listed in the SCOPUS database). These indicators set as average for the examined period of 2017–2023 ranged from 1.04 to 2.12.

An equally interesting observation was provided by the results of research carried out using the International Collaboration indicator for the field of Medicine – ICM (Table 5 and Figure 4), which showed a growing participation of foreign researchers in scientific publications affiliated with Polish medical universities.

However, the number of Topic Clusters for the field of Medicine (Table 6) showed the highest number of publications in the Topic Cluster TC.1500 (3519), the highest level of the FWCI indicator in TC.12 (2.83), and the PP indicator - also in TC.1500 (at the level of 100). In turn, the number of Topic Clusters for the field of Medicine (Table 7) showed the largest number of publications in the Topic Cluster TC.1 (245,359), the highest level of the FWCI indicator, which presents the significance of citations in a given field in relation to the average of all similar publications, was in TC.620 (2.59), and the highest PP indicator was found in TC.1 (100).

In our opinion, the findings of this study contribute to broadening knowledge about the publication landscape, and in particular the intensity of employees' activity in the field of medical sciences at Polish medical universities. They also shed light on the undertaken leading thematic scope and cooperation with foreign researchers. The observed phenomena did not indicate strong long-term increases in the number of publications, and at the same time

the increase that was noted was clearly of an occasional nature. Thus, in our opinion, the conducted research relating to the last stage of a research process (publication of results) may be helpful in understanding the effects of the “publication game” by revealing topics that increased publication success. It is obvious that these topics are undertaken due to public expectations of scientific discoveries in certain areas (e.g. related to COVID-19). However, it cannot be ruled out that the attractiveness of these topics for publishers did not contribute to directing (subordinating) research efforts to this topic. This statement requires confirmation in additional research, which will provide empirical arguments based on which it can be later verified. It cannot be ruled out that the choice of a research topic is the result of a researcher's scientific passion and their personal involvement in a significant and socially important topic. At the same time, it must be emphasised that the choice of socially relevant topics reflects scientific passion, and the willingness to publish is functional when scientists strive to share important discoveries. In contrast, the intention to publish to “score points” as the ultimate goal, regardless of the relevance of the topic, represents a significant departure from the primary goal that is a passion-driven scientist.

In the future, it will be worth supplementing the findings made and presented in this study and comparing them with the results of empirical research obtained using an available measurement tool in order to assess the degree of publication pressure experienced (or not) by scientists. Such an instrument may be valuable for further research on the causes and consequences of the publication pressure, such as its impact on publication quality and on the mental health and performance of scientists. Moreover, a multidimensional assessment of the publication pressure will make an important contribution to understanding its determinants and consequences and will constitute an important input to the current debate on scientific publications. We believe that further research is necessary to evaluate the psychometric properties of the publication pressure in specific research populations such as doctoral students and professors.

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## Ethical approval

Not applicable.

## Conflict of interest

The authors declare no conflict of interest.

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**Address for correspondence:**

Prof. **Jarosław Karpacz**  
Faculty of Law and Social Science  
Jan Kochanowski University  
Kielce, Poland  
E-mail: jkarpacz@ujk.edu.pl

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